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woody spathe is not deciduous, and adds to the untrim appearance of the tree. In Egypt the fruit clusters are often of a hundred pounds weight, and hang down from stems as large as a man's wrist. The yellow dates are the smallest, and the black ones the largest in some places, but there is a variety of yellow dates three inches long. The cluster does not all ripen at once, but each date that matures is at once removed to make room for the rest. Dried, they form the chief food for the Arabs, and are much liked by all who are able to get them. The crushed and dirty dates that come to our markets are very inferior.

The date tree is not so long lived as the cocoanut, and its uses are by no means so extensive. The wood is soft, the blades of the leaves hard and narrow, and of course the coir and oil are wanting, and yet the fruit is perhaps the most delicious produced by any palm.

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## THE CYNTHIA SILK-WORM.

BY W. V. ANDREWS.

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It is not at all a creditable circumstance to us, as an enterprising people, that so little has hitherto been done towards making silk-culture a source of national wealth. Thirty years ago, according to Mr. d'Homergues' account, some spasmodic efforts were made in this direction; but, for some cause, chiefly I imagine from the absence of skilled labor, the thing came to naught. In Connecticut, principally in the counties of Windham and Tolland, sewing-silk was manufactured to some extent; but even there the "hands" persisted in reeling the silk after the fashion of their grandmothers, and were far too knowing, and shrewd, to allow themselves to be taught anything by outsiders, who, probably under the cloak of a desire to communicate know-

ledge, harbored some base design on the pocket. What is being done in that locality now I do not know, and the only sewing-silk manufactory that I know of, is that of the "Singer Sewing Machine Company," in New Jersey. Of course all the silk they use is imported.

The silk-producing moth of the period above adverted to was, of course, the *Bombyx mori*, and the same species has continued up to a very recent period, to furnish most of the silk manufactured in Europe. With the conservative feeling which forms so admirable a trait in their character, the English have stuck to their old friend through good and evil report, till at last the disease which threatens to exterminate this once valuable insect, has compelled them, as well as their neighbors the French, to cast about for some more healthy silk-producer. Two species seem to recommend themselves, and they are the *Yama-mai*, and the *Cynthia*; the last-named being the favorite; and this is the moth whose culture here, as a silk-producer, it is the object of this paper to recommend. It has been asked, Why not select some native American species, and thus get rid of difficulties which will, doubtless, occur in the attempts to acclimatize this foreigner?

In the first volume of this Magazine, Mr. Trouvelot has shown, more or less satisfactorily, that our principal silk-worms, *Cecropia*, *Luna*, and *Promethea*, do not produce a cocoon suitable for the silk manufacturer. I must confess that I have my doubts of this. It seems to me, as the cocoon is made of silk, that, under favorable circumstances, it may be made serviceable; but I concede that, at present, we should turn our attention to other species. The *Polyphemus*, Mr. Trouvelot thinks, is the only American silk-worm worthy of present attention, and I agree with him. The silk produced by it is coarse and strong; and I am positive may be turned to profitable account. It possesses, too, I think, an advantage, in that the cocoon can be unwound with comparative ease.\*

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\* For descriptions and figures of the *Telega Polyphemus*, see AMERICAN NATURALIST, Vol. I, pages 35, 85, 145, and plates 5 and 6.

But the principal objection to the American silk-moths is, that they produce only one brood a year, with the exception, I believe, of *Luna*. Now the *Cynthia* can be made to produce two broods easily; and, so far as I can see, the cocoon of the second brood is just as good as that of the first. Again, the food of some of the species is of very slow growth; such as the oak, the elm, and the hickory.

Now the food of the *Cynthia*, at least in this country, is the ailanthus, a tree of luxuriant foliage and rapid growth; and, at present, more ornamental than useful. If we acclimatize the *Cynthia*, we can reverse the order of things. It is somewhat doubtful, for reasons I shall presently give, whether the ailanthus is the natural food of this insect; but I will waive that consideration for the present.

In view of the confusion which evidently exists as to the identity of *Cynthia*, I think it best here to state, that the insect I am writing about is the one figured, tolerably well, in Duncan's Exotic Moths, Plate 14, fig. 1. The coloring there is not quite correct, but that is, doubtless, the moth.

Drury (Westwood's edition) has also given a tolerably accurate figure in his "Illustrations," and taking (as every body else seems to have taken) his description from that of Dr. Roxburgh's Memoirs on the Silk-producing Moths of the East (Transactions of the Linnean Society, Vol. 7), calls it the "Arrindy Silk-worm;" says that it feeds on the castor-oil plant, and that its *soft* cocoons are so delicate and *flossy*, that it is impossible to wind them off, and that therefore they are spun like cotton. Now this description, which is substantially quoted by Mr. A. R. Grote in the "Practical Entomologist," by no means applies to the cocoon of the *Cynthia*. It is not a soft, flossy cocoon, like that of *Cecropia*, but hard like that of *Promethea*, which indeed it generally resembles. There is, to me, certainly a difficulty in winding it; and this, at present, is the main objection to it. But this difficulty arises from our ignorance of the proper solvents for the gum of the cocoon, and the proper temper-

ature at which to apply it. Pearlash is the best solvent I have yet found, but it is not, as I apply it, satisfactory. In fact a practical silk-reeler is required to decide this point. Mr. Grote, in quoting Kirby, who quotes Drury, expresses a doubt as to whether the *Cynthia* is really meant by the latter; and from all that I can learn the castor-oil feeder is certainly a different species.

Mr. Grote, in a subsequent paper in the "Practical Entomologist," says that the *Cynthia* is the *Yama-mai* of Japan, and that in that country it is an oak feeder; but surely this is a mistake of the Dutch author, from whom Mr. Grote transcribes. I have not reared *Yama-mai*, but I have some of its eggs, sent me by Dr. Wallace, of England, and they are nothing like the eggs of *Cynthia*. They are much larger and altogether of a different color.

To make confusion worse confounded, the very capital description of *Cynthia*, given by M. Tegetmeir in a recent English publication, is accompanied by a colored drawing of the insect, as much unlike that moth as the artist could conscientiously make it. So when we have the description right, the illustration is wrong; and *vice versa*, when the illustration is good, the description is bad. However, we have fixed on our moth. It is, as I said before, the *Saturnia Cynthia* of Duncan. Farther description I need not give, except to assure ladies who have so far got over their horror of "bugs" as to rear butterflies and moths, that they will find the extreme beauty, both of the *Cynthia* and of its caterpillar, a full recompense for any little trouble they may take in raising them.

I will now condense from a little entomological journal kept by me (I make no pretensions to being an entomologist), some remarks, having practical application to the subject before us; and which, I hope, may be of service to those who wish to assist in acclimatizing this beautiful moth, with a view to its ultimate culture as a silk-producer.

The eggs, which I obtained from Mr. John Akhurst, of

Brooklyn, were laid on or about the 18th of May, last year. From description, I had expected to find the eggs white, and without any central depression. I found them white, *streaked with black*, and the depression very obvious. The eggs commenced hatching out on the first of June, making about twelve days in the egg. The caterpillar is yellow, with transverse rows of black dots; head, black. On the 6th of June occurred the first moult, the yellow color brightening somewhat. On the 11th of June, the second moult, the color lighter, almost white. After the third moult the color is white, with black spots; the head and legs yellow. In fact, the body is covered with a very fine white powder. It has been objected to the *Bombyx mori* that it must be raised within shelter, seeing that exposure to heavy rains is injurious to it. Now *Cynthia* stands exposure to the wet admirably, as I had perfect satisfactory proof last year, the above-named white powder, as it is conjectured, standing it in good stead in a storm. Moreover, a certain amount of moisture is necessary for it. The caterpillar drinks greedily, and, in the event of indoor culture, I advise that the branches, when served fresh, should either be dipped in water, or sprinkled abundantly, particularly after the third moult.

I need hardly impress upon the mind of any one likely to read this paper, the absolute necessity of keeping the caterpillar well fed; but it may be as well to forewarn everybody that these creatures have excellent appetites, which "grow with what they feed upon." This is peculiarly observable towards the close of the caterpillar life, say after the last moult, when the craving seems to be insatiable. For those who have the opportunity of doing so, after the third moult, it is a good plan to place the caterpillars on low ailanthus trees in the open air. Of course they are liable to destruction here by birds, as well as by parasitic flies; but still, if you have a large quantity, and it is inconvenient to feed them under shelter, this plan may be adopted. Last year I

raised a great many in this way (this year I intend to increase the number), and as the caterpillar does not wander, I found no difficulty in collecting the cocoons. I allowed some to remain on the trees for the second brood, and had the satisfaction, in the fall, of seeing lots of cocoons swinging in their leafy cradles. And now is the time to speak of the ailanthus as not being the natural food of *Cynthia*. It feeds, we are told, on the castor-oil plant, laburnum, teazle, plum, honey-suckle, and spindle-tree. This sounds very much like saying that it will eat anything; but so far as my experience goes it thrives better on the ailanthus than on anything else; but the reason that I think that tree is not its natural food, is this: the caterpillar forms its cocoon very much in the manner of *Promethea*; that is, by folding a leaf around it, having first gummed the leaf-stalk to its branch, so as to prevent, one would suppose, its falling to the ground in winter. But the leaf of the ailanthus is what botanists call a compound leaf; so the unfortunate caterpillar, not being sufficiently versed in botany to know this, merely gums the *leaflets* to the petiole; the leaf of course falls in the autumn, and the pupa, instead of lying high and dry as was intended, lies under the snow all the winter; with what consequences to itself I am not able at the moment to say. It would appear, therefore, reasoning from analogy, that the tree forming the natural food of *Cynthia* has a *simple and not a compound leaf*. It may be of consequence to note this, for the quantity and quality of the silk produced by any worm very much depend on the food it eats, and the natural food must be the best.

I will now proceed with my extracts from the journal. On the 28th of June, just twenty-eight days from the hatching, the caterpillars commenced forming their cocoons; and here let me say to those who propose to raise them in the house, that at this period it is essential that there shall be a good supply of well-leaved branches. Every caterpillar will require a leaf to itself, and if these be not forthcoming the

cocoons will be doubled, and even trebled, to the great injury of the silk, it being impossible to wind the silk off a double cocoon. On the 21st of July the moth appeared; three weeks in the cocoon; and by the 6th of August the second brood of caterpillars began to hatch out; these going into the pupa state about the middle of September, and remaining there up to June 10th, I having kept them back a little on account of the backwardness of the spring. "On that date the first *Cynthia* from my collection of cocoons made its appearance, and there is every prospect that a few days more will witness an increase in that portion of my insect family."

I have now said enough to show that the rearing of this moth is a very easy, simple process, one which may be attended to by any boy or girl of ordinary intelligence, superintended of course, if the number raised be very large, by some older person. In a word, it furnishes profitable employment for those members of the family unable to perform harder labor. And this reminds me that if the feeding be done within doors, the food branches, or, at the outset, simply the leaves, should have their stems immersed in a vessel of water; some precaution being taken to prevent the young caterpillars from wading into, or falling into it. When nearly full-grown the clusters of fine caterpillars, set off by the rich green of the aïlanthus leaf, form a very beautiful sight; and although I cannot conscientiously recommend such an ornament for the drawing-room table, it certainly may be placed almost anywhere without being offensive to the most fastidious eye. Plenty of air and light should be given them, but they should not be exposed to the direct rays of the sun. Reared, even from motives of curiosity, and without a view to immediate pecuniary results, the task cannot be performed without teaching a lesson, which will be of infinite value to the mind anxious to inform itself of the wonderful workings of that law of nature, that transforms a small crawling animal, of an eighth of an inch in



length when hatched from the egg, into a beautiful flying creature large enough to be mistaken for a bird, and with no more resemblance to the aforesaid animal than an eagle has to a frog.

But now a final word as to the steps to be taken to induce our people to take up this business of silk-culture. Can it be made to pay? is, I suppose, the main question. I need go into no statistics to show that enormous sums of money are sent to Europe every year to pay for silk imported; the fact is notorious. Perhaps no nation in the world is so addicted to the use of silken goods as the American. The general government collects large sums of money in the shape of duties on silk, and we can hardly, at the moment, expect that it will do much to encourage its culture here. But I am confident that it can be made to pay without government assistance. For, recollect, that we have the food of the caterpillar growing already in the greatest abundance among us, flourishing with a luxuriance which we sometimes find inconvenient; and of such easy culture that in two years we could have millions of bushes (and they should be kept as bushes) growing; and on soil, too, that would probably produce nothing else. This is an advantage that the early silk-growers did not possess, the raising of the mulberry being no such easy matter. Then the larva of the *Cynthia* can, as I have said, be raised in open air, and the labor of the young, or of the feeble, is sufficient to perform all the work required; and thus the objection of the "high price of labor," so fatal to many an American enterprise, fails in this case. Even children may be induced to raise a few bushels of cocoons for the sake of pocket-money. Still there is no use in raising cocoons if there are no manufacturers to purchase them. It seems difficult to account for the inertness of our capitalists in affairs of this kind. One would suppose that with men possessed of wealth, the reputation of having been instrumental in introducing a new source of national industry, would be sufficient to induce

some few at least to bestir themselves in so important a matter. But failing this, what objection is there to the *State Government* affording a little assistance in starting an enterprise promising to be of such great benefit to the people? I look upon an enterprise of this kind as of the nature of building a railroad, or constructing a telegraph line, the benefits to be derived from which, being of a public nature, come very properly under the immediate supervision of the government. It would be out of place in this journal to go minutely into such things as the duties of governments in fostering national industry, but I may be permitted to say, that, although disapproving of the principle of protective tariffs, I see nothing conflicting with my convictions on this point in saying, that, if the timidity of individual capitalists can be overcome in no other way, the State Governments would be justified in making advances, or in offering bounties, sufficient in amount to guarantee parties embarking in the enterprise of silk manufacture against any actual temporary loss.

In England, as I am told, private enterprise is doing all this. Wealthy individuals are largely cultivating the aïlanthus for the *Cynthia*, and are encouraging parties in rearing the *Yama-mai*, and other silk-producers; and why should not as much enterprise and patriotism be found here? To be sure, entomologists are not there laughed at for being "bug-hunters;" and there are numbers of ready hands willing and anxious to assist in the undertaking; but I am not without hope that sufficient intelligence will be found amongst ourselves to enable people to understand that a devotion to the study of Nature's laws, even in the insect world, is not incompatible with the possession of, at least, average common sense.

Let it not be forgotten that the rearing of the *Cynthia*, as a silk-producer, is not a new, untried experiment. The Chinese, for a longer period than I should like to mention, have manufactured silk from its cocoons; the garments made from it possessing a durability quite annoying to ladies of the

Flora M'Flimsy type. Dresses made up for ladies in the early dawn of womanhood do very well for their grandchildren arrived at a suitable age; and, if this be not a recommendation, let us hope that the fact that some English manufacturers have given the opinion that the silk from the *Cynthia* may be made into shawls equal to the best *India*, may somewhat reconcile our fair countrywomen to the use of an old article possessing the preposterous quality of being as good as new, if washed in a little cold water.

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## REVIEWS.

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THE NORTH AMERICAN GRAPES. *By Dr. George Engelmann.*—Perhaps the first plant noticed on the continent of North America, even before Columbus and before the Pilgrims,—a plant identified with the discovery of America itself,—was the Grape-vine; it gave to the country the name *Vineland*, and later, to a part of it, that of *Martha's Vineyard*. And yet the grape-vines, many forms of which grow from Canada to the Rio Grande, and from Virginia to California, are among the least thoroughly known plants of North America. Linnaeus knew two species; and that sagacious observer, the founder of the flora of North America, Michaux, added three more. These five species are acknowledged to this day as the principal forms found in the regions between the Atlantic and the Mississippi. But even in their native haunts they vary to such a degree, that both scientific and non-scientific observers have never felt satisfied about them. Rafinesque, about fifty years ago, undertook to describe and classify these forms; but, with his loose observation and lax scientific conscience, he, as usual, instead of becoming a guide, created inextricable confusion. Le Conte, long after him, did little to unravel the entanglement; and since their efforts to distinguish imaginary species, the tendency has rather been to combine what were formerly considered, even by conscientious authors, as distinct species.

I have long devoted much attention to the grape-vines of my home (St. Louis), but have become satisfied that no satisfactory solution can be obtained without the coöperation of the friends of botany throughout the whole country; so I ask from their love and zeal for our science, and from the general interest which this particular investigation now commands, their friendly coöperation.

In order to arrive at satisfactory conclusions, it is necessary to study all the forms which present themselves, in all their bearings, and under